

# MadLab PICLAB

## Construction

Construction is straightforward. First fit and solder the resistors (R1 to R33) and trim their legs. Identify the resistors by the coloured stripes on the body. Next fit and solder the capacitors (C1 to C12), paying attention to the polarity of the electrolytics (negative is marked by a stripe on the side of the body, and also by the shorter leg). The ceramic and polyester capacitors can be fitted either way around.

Then fit the diodes (D1 to D6) and transistors (TR1 to TR4). The cathode end of the diodes is marked by a black line on the body of the component, and on the pcb by a line on the symbol and a small '+'. Be careful to distinguish the Zener (D6) from the 1N4148 diodes (D2 to D5) as they look very similar. The 1N4148 diodes are supplied as a strip of four components. The symbols on the pcb indicate the orientation of the transistors (flat side of the component against the flat side of the symbol).

Next fit the IC sockets (IC1 and IC2) matching the notch in the socket against the notch in the symbol on the board, and the dual 7-segment display matching the decimal points on the pcb symbol. Care should be taken when soldering these components to avoid solder bridges between the pins. It is not recommended that the chips are soldered directly to the pcb.

Solder the LEDs (LED1 to LED10) matching the shorter leg (flat on the rim) to the hole with the line. Ensure that the LEDs are flush with the board.

Solder the 12V regulator (REG2) matching the shape to the symbol on the pcb (flat side of the component against the flat side of the symbol). Bend the legs of the 5V regulator (REG1) at right angles and fit flat on the pcb within the symbol (the metal heatsink side should be touching the pcb).

Solder the PIEZO either way around. Solder the CHOKe either way around.

Solder the infrared sensor (IR) matching the shorter leg (flat on the rim) to the hole with the line.

Fit the microphone (MIC) within the circle on the pcb. Solder the crystal (XTAL) and resonator (RES) either way around.

Fit and solder the pushbuttons (S1 to S5) flat on the pcb.

Solder the 9-way D socket being careful not to bridge pins. Solder the two large holes as well.

Solder the power connector.

Solder the ZIF socket matching the notch and handle to the symbol on the pcb.

Don't fit the chips into their sockets until you have thoroughly checked your construction. A good visual inspection should be the first stage. Check that all the components have been inserted correctly and that there are no dry joints and no solder bridges between pins. Bend the legs of the two ICs inwards slightly then fit into their sockets matching the notch in the chip to the notch in the socket. Be careful to use the correct 18-pin PIC in IC1. The other PIC is for testing.

Rubber feet for the 4 corners are supplied.

The power supply used should provide a regulated 9 to 12V dc output, with centre positive 2.1mm plug, capable of delivering 300mA.

## **Component List**

### Resistors

R1,R5,R6,R21,R24,R26,R30,R31	1k (brown, black, red, gold)
R2,R3	100R (brown, black, brown, gold)
R4,R9,R10	47k (yellow, purple, orange, gold)
R7	0R (black)
R8,R27	470R (yellow, purple, brown, gold)
R11,R12,R13,R25	10k (brown, black, orange, gold)
R14-R20,R32,R33	150R (brown, green, brown, gold)
R22	1M (brown, black, green, gold)
R23	47R (yellow, purple, black, gold)
R28	4k7 (yellow, purple, red, gold)
R29	220R (red, red, brown, gold)

### Capacitors

C1,C2	10u electrolytic 25V (blue or black)
C3-C7,C11,C12	100n polyester (yellow or blue, rectangular)
C8,C9	22p ceramic (brown)
C10	47u electrolytic 25V (blue or black)

### Semiconductors

LED1,LED5	5mm yellow LED
LED2,LED6	5mm green LED
LED3,LED7	5mm orange LED
LED4,LED8,LED10	5mm red LED
LED9	5mm bi-colour green/yellow LED (diffused)
IR	3mm infrared sensor (clear)
TR1	BC547B transistor
TR2	MPSA13 transistor
TR3,TR4	BC557B transistor
D1	1N4001 diode (black)
D2-D5	1N4148 diode (orange)
D6	Zener 11V (orange)
REG1	L7805 5V regulator
REG2	78L12 12V regulator
DISPLAY	dual 7-segment display
IC1	PIC16C56-HS microcontroller (CC1X) + 18-pin socket
IC2	MAX232CPE RS-232 driver + 16-pin socket

### Miscellaneous

CHOKE	4700u (yellow, purple, red, gold)
PIEZO	piezo (black)
MIC	microphone
XTAL	crystal 4MHz (silver)
RES	ceramic resonator 4MHz (blue)
ZIF	24-way ZIF socket + test/user PIC16F628
S1-S5	miniature pushbutton
RS232	9-way D socket + RS-232 cable
	2.1mm dc power socket

### PCB

4 x rubber feet  
installation CD-ROM

## **Testing**

Use a small piece of wire for an RS-232 loopback test. Connect the wire to pins 2 and 3 of the 9-way D socket (pushing the ends of the wire into the numbered holes). Insert the test chip (PIC16F628) into the ZIF socket (the notch in the chip nearest the handle) and lock it in place.

Apply power to PICLAB while the RUN/STOP button is held down. This tests the RS-232 circuitry and tests reading/writing to the target PIC. The red POWER light should come on, and the ACTIVE light should stay green after a couple of seconds. If the ACTIVE light stays yellow there is a problem with the construction.

Remove the power and re-connect the power cable without RUN/STOP being pressed. The ACTIVE light should flash green twice.

Press the RUN/STOP button. The ACTIVE light should be green. The piezo should beep twice. LED5 (yellow), LED6 (green), LED7 (orange) should be on.

The dual 7-segment display should show '00'. Clap your hands a few times close to the microphone. The display should count up.

Press BUTTON1, LED1 (yellow) should light. Press BUTTON2, LED2 (green) should light. Press BUTTON3, LED3 (orange) should light. Press BUTTON4, LED4 (red) should light.

Shine light on the IR sensor (from a torch for example), LED8 (red) should light. Cover the IR sensor, LED8 should go out.

If your PICLAB passes all these tests then it is fully functioning.

The supplied PIC16F628 is available for user programs once its testing role has been completed.

## **Software Installation**

To install MadLab PICLAB, run "setup.exe" on the supplied CD-ROM disc and follow the instructions on screen. If you are using PICLAB in conjunction with Crocodile Technology 1.5 and above from Crocodile Clips, you can select the directory to install support for this application.

Note that the installation of Crocodile Technology automatically installs PICLAB to your system. However the included disc contains a more up-to-date version of the application. It also makes it possible to use PICLAB as a stand-alone program and to program in BASIC.

The default operation with Crocodile Technology is for PICLAB's window to be hidden from the user, which makes operation simpler for beginners. However if you wish to have access to PICLAB's advanced features from within Crocodile Technology then run PICLAB from the Start menu, select "CT Expert Mode" in the Options menu, and exit the program. The next time you download a flowchart from Crocodile Technology, PICLAB's window will appear.

The installed file "piclab.pdf" is a complete manual for PICLAB. There is also online help built into the application.

Read the file "readme.txt" for late-breaking information.

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